

CLAIMS

What is claimed is:

1. A homopolar machine comprising:
 - a shaft;
 - an armature assembly, coupled to the shaft, that includes a plurality of armature conductor turns;
 - an outer flux return that encloses the armature assembly; and
 - a plurality of stator-current collector arrays, coupled to the outer flux return, that encircle the armature assembly, each stator-current collector array including a plurality of current collectors that maintain substantially constant contact pressure with the armature conductor turns in the presence of high magnetic fields to provide a sliding electrical current interface with the armature conductor turns.
2. A homopolar machine in accordance with claim 1, wherein the outer flux return comprises a geometry that directs magnetic field lines substantially parallel to a direction of current flow in a region where the plurality of current collectors contact the armature conductor turns to minimize induced magnetic forces that may deflect the current collectors in a circumferential direction.
3. A homopolar machine in accordance with claim 1, wherein each of the current collectors comprises a flexible, solid material that is coupled to its respective stator-current collector array so that it bears up against an outer rotating rim of the armature conductor turn with a pressure governed substantially by a spring constant of the flexible, solid material.
4. A homopolar machine in accordance with claim 1, wherein each of the current collectors comprises a flexible, solid electrically conductive material having spring constant properties that permit a preload pressure on the armature conductor turn to remain substantially constant as the material exhibits limited wear and deflection from external forces.
5. A homopolar machine in accordance with claim 1, wherein each of the current collectors comprises electrically conductive fibers made from copper.

6. A homopolar machine in accordance with claim 1, wherein each of the current collectors comprises electrically conductive fibers made from copper alloys.

7. A homopolar machine in accordance with claim 1, wherein each of the current collectors comprises electrically conductive foils made from copper.

8. A homopolar machine in accordance with claim 1, wherein each of the current collectors comprises electrically conductive foils made from copper alloys.